



# **PFAS Briefing**

**for**

## **AQD's Air Advisory Council**

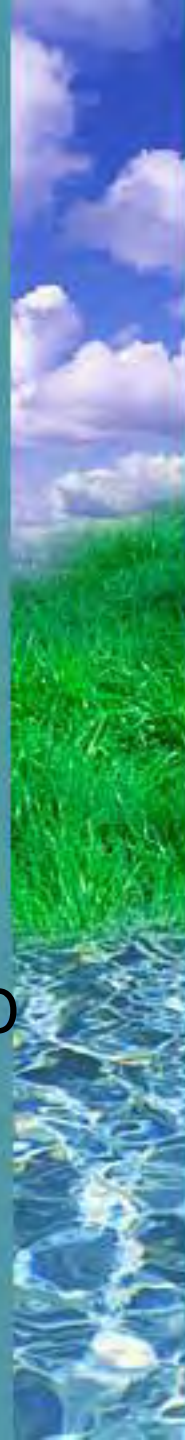
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February 28, 2018





# **Per & Polyfluoroalkyl Substances PFAS**



## Taking Action, Protecting Michigan

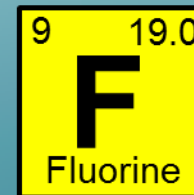
### Governor's Directive Creates The PFAS Action Response Team

#### What You Need to Know About PFAS Contamination

Perfluoroalkyl and polyfluoroalkyl substances (PFAS), also known as PFCs, have been classified by the US Environmental Protection Agency as an emerging contaminant on the national level. PFAS are a suite of chemicals historically used in thousands of applications throughout the industrial, food, and textile industries. They are incredibly stable, breaking down very slowly in the environment, and are highly soluble, easily transferring through soil to groundwater. PFAS contamination has been identified in several locations across the state of Michigan as a result of use in multiple industries across the State. PFAS is used in firefighting foams, food packaging, cleaning products, and various other products. It is also used by many industries such as plating, tanneries, or clothing manufacturers, where waterproofing may be required or a protective film is needed in a manufacturing process.

[www.michigan.gov/pfasresponse](http://www.michigan.gov/pfasresponse)

- PFAS not ~~PFCs~~ (Because PFAS is more comprehensive terminology and is less confused with perfluorocarbons (also abbreviated as PFCs) (Buck et. al 2011 SETAC))
- A large family of synthetic organic compounds that contain multiple Fluorine (F) atoms ~ 3,000
- Fluorinated aliphatic carbon chain
- C-F bond strongest
- Not naturally occurring
- Known or suspected toxicity, especially for PFOS and PFOA
- Air emissions/deposition have been documented







# Historical Use...

## PFAS Development....

1930's



Teflon accidentally discovered in 1938

1940's



Teflon used in the Manhattan Project for the development of the atomic bomb

1950's



Consumer and industrial products (Polymers)

1960's



Aqueous Film Forming Foam (AFFF) is developed

## ... and Evolution

1970's



Use of PFAS  
significantly expands  
in different industries

2000's



Global distribution of certain  
PFAS in biota

Voluntary phase out of products

Current



Increase public scrutiny  
Changing regulatory climate  
Lawsuit settlements  
Development and use of new PFAS



# MDEQ Activity

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- Wurtsmith Airforce Base – Oscoda, MI - 2010
- PFAS Toxics Steering Group 2011 White Paper
- MDHHS – EPA Great Lakes Restoration Initiative Grant 2014
- Detected in surface waters & fish
- Fish consumption guidelines for 13 water bodies
- Since 2011, 3 public drinking water systems contaminated
- “Do not Eat” fish advisory Clark’s Marsh & the Au Sable River 2012 [www.michigan.gov/eatsafefish](http://www.michigan.gov/eatsafefish)
- USEPA established lifetime health advisory values for drinking water of 70 ppt for both PFOS & PFOA 2016
- PFAS Toxics Steering Group Addendum to White Paper 2017
- Rockford Tannery August 2017



# ...MDEQ Activity

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- Plating Facility – Multi-media inspections –Fall 2017
- Textile Coater Inspection – October 2017
- Governor Exec Order – MPART November 2017  
[www.michigan.gov/pfasresponse](http://www.michigan.gov/pfasresponse)
- National Association of Surface Finishers Meetings  
Fall 2017
- Two PFAS Boards to be Formed – January 2018
- Part 201 clean-up criteria adopted for PFOA & PFOS  
(70 ppt) in groundwater January 2018
- DEQ Sues Wolverine – EPA (Unilateral Administrative  
Order) January 2018



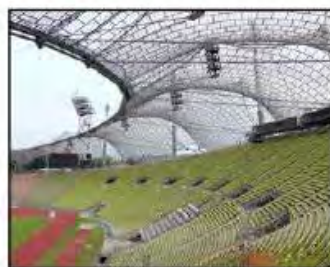
## Industrial Use of PFAS



**Aerospace**



**Apparel**



**Building and  
Construction**



**Chemicals and  
Pharmaceuticals**



**Electronics**



**Oil & Gas**



**Energy**



**Healthcare and  
Hospitals**



**Aqueous Film  
Forming Foam**



**Semiconductors**

# Industrial Uses & Sources of PFAS



- Mist suppression for chrome plating
- Electronics manufacturing
- Oil and mining for enhanced recovery
- Performance chemicals (hydraulic fluid, fuel)





# Consumer Uses & Sources of PFAS

- Food surfaces (Teflon<sup>1</sup> pans, pizza boxes, popcorn bags, food wrappers)



<sup>1</sup> <https://en.wikipedia.org/wiki/Polytetrafluoroethylene> PFOA, which used to be a key ingredient in making Teflon, has been phased out, however there is little evidence that the chemicals that have replaced PFOA are much safer.

<sup>2</sup> Shaider, *Environ. Sci. Technol. Lett.*, Publication Date (Web): February 1, 2017  
<http://pubs.acs.org/doi/ipdf/10.1021/acs.estlett.6b00435>

# DEO Consumer Uses & Sources of PFAS

- Polishes, waxes, paints
- Stain repellants (carpets, clothing and upholstered furniture)
- Cleaning products



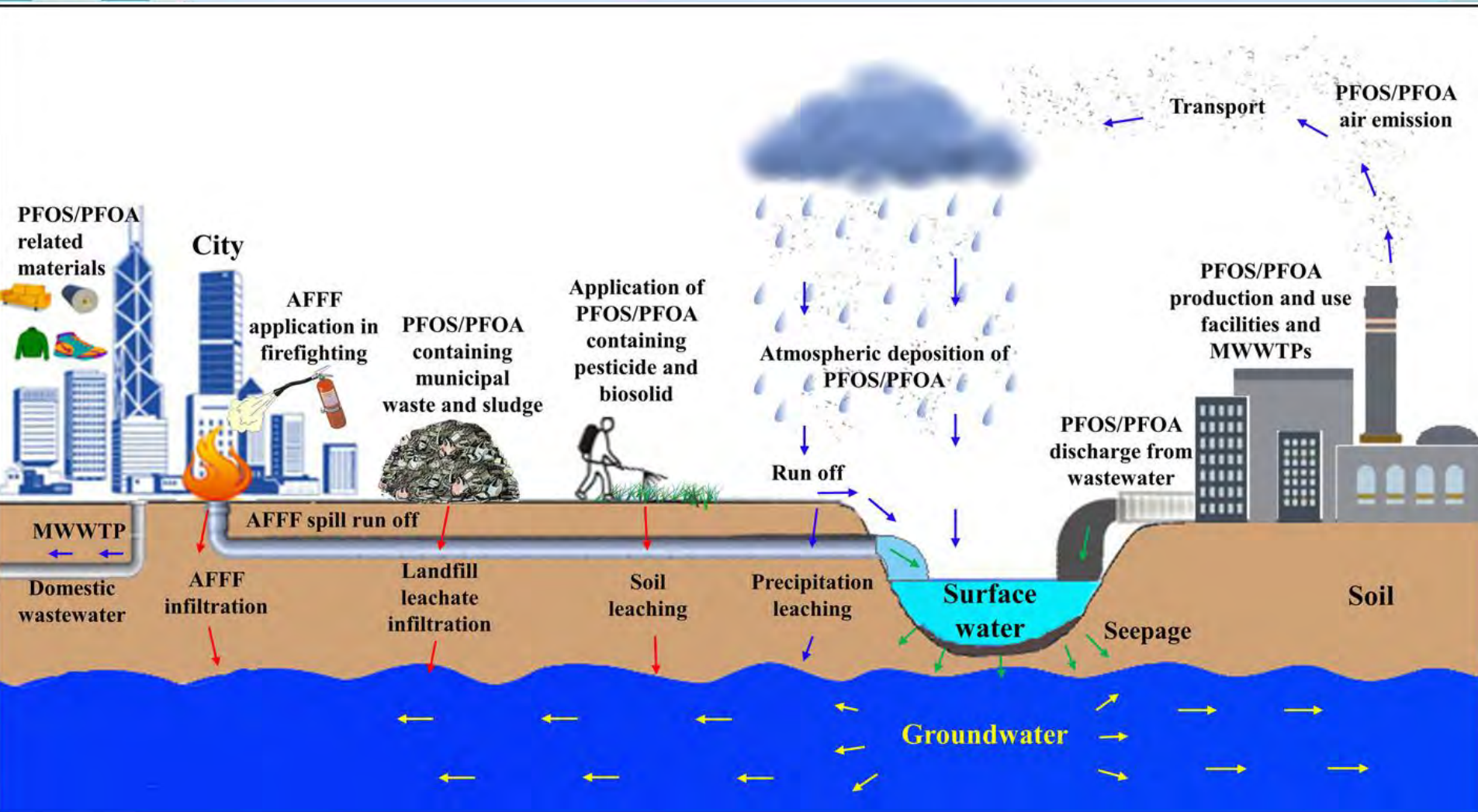
From: Hillary Thornton, USEPA Region 4





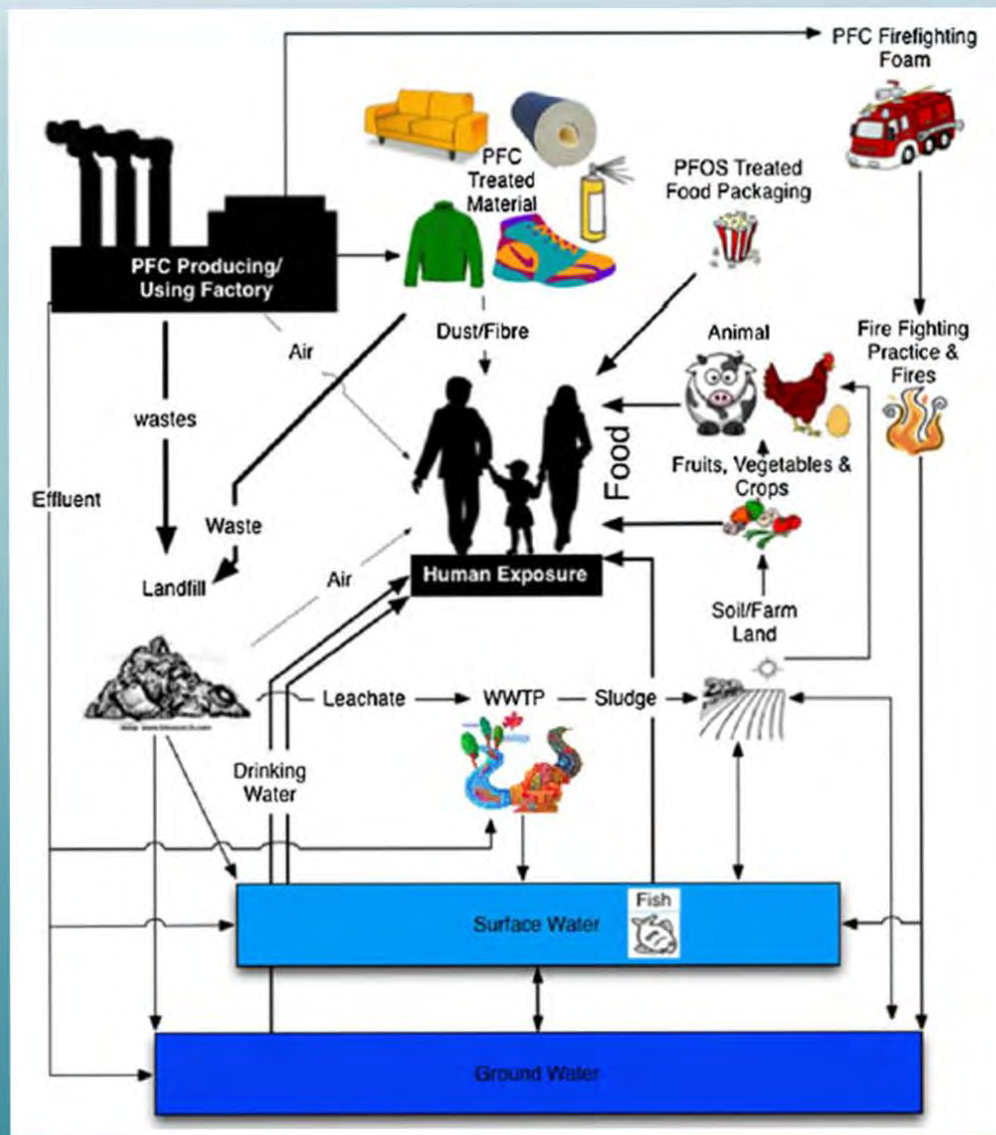
- Landfills
- Land application of biosolids







# DE Possible Exposure Routes



From Oliaei 2013, Environmental Science Pollution Research

# DE Human Exposure Pathway

- Major<sup>1,2</sup>
  - Diet (bioaccumulation)
    - Fish and seafood
    - Homegrown produce
  - Drinking water
  - Incidental soil/dust ingestion
- Usually minor
  - Dermal absorption
  - Inhalation



1 Oliaei et al., 2013. Environ. Sci. Pollut. Res. Manag. 20:1977-1992

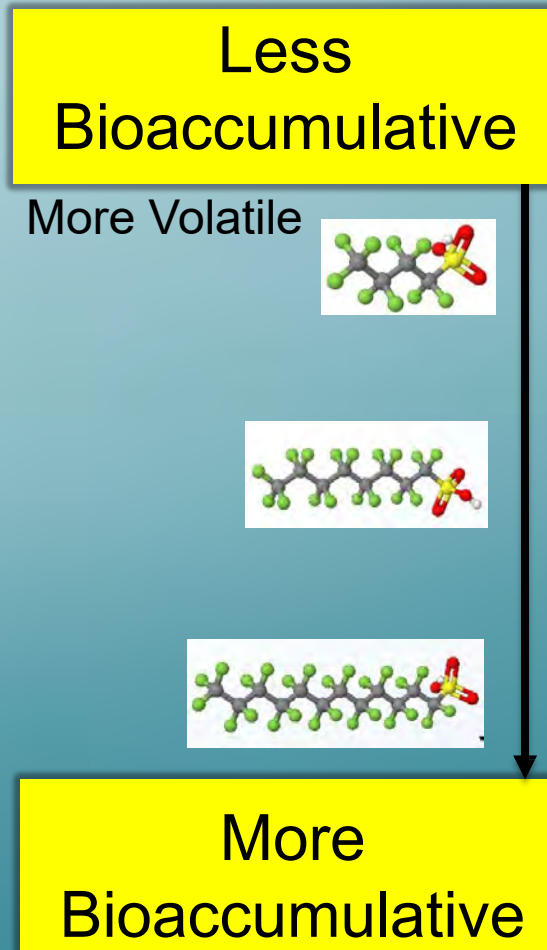
2 Domingo, 2012. Environment International 40:187-195





# Bioaccumulation of PFOA/PFOS

- PFASs are detectable in nearly any biological tissue
- Many PFASs bioaccumulate, especially longer PFASs and sulfonated PFASs (e.g., PFOS)
- Partition to protein, not fat
  - Blood, liver, kidney, muscle are primary repositories



Conder et al., 2008. Environ  
Sci Technol . 42:995-1003

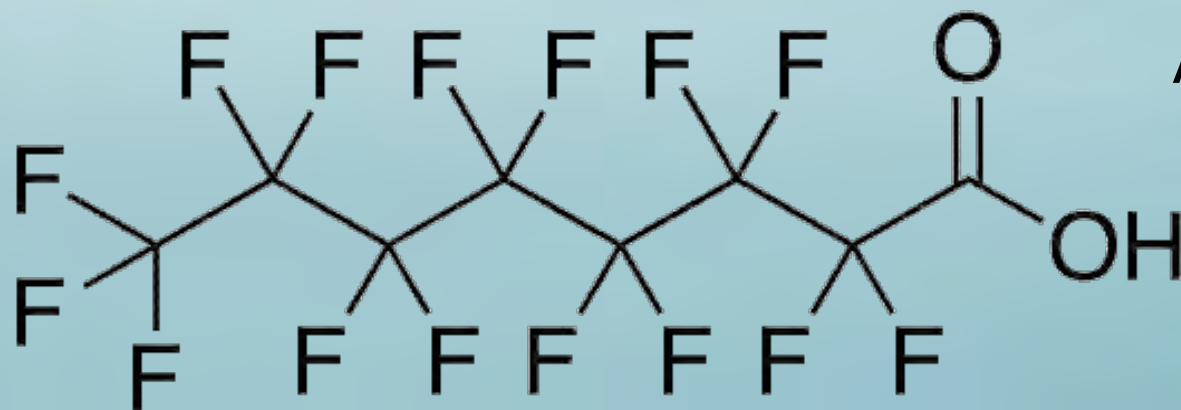


# WRD Rule 57 Value

- The DEQ's Rule 57 Water Quality Value:
- 11 ppt for PFOS for DW
- 12 ppt for PFOS non DW
- 420 ppt for PFOA for DW
- 12,000 ppt for PFOA non DW

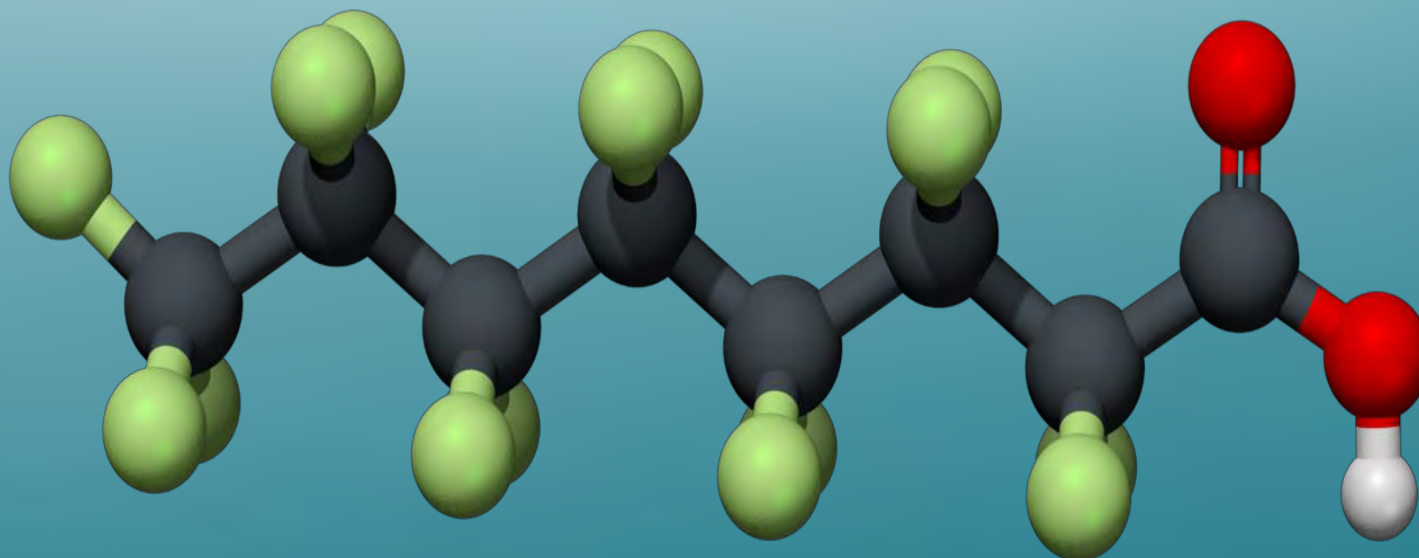


# PFOA



Perfluorooctanoic  
Acid (cas# 335-67-1)

Chemical Formula:



# DE PFAS Release – PFOA (C8)

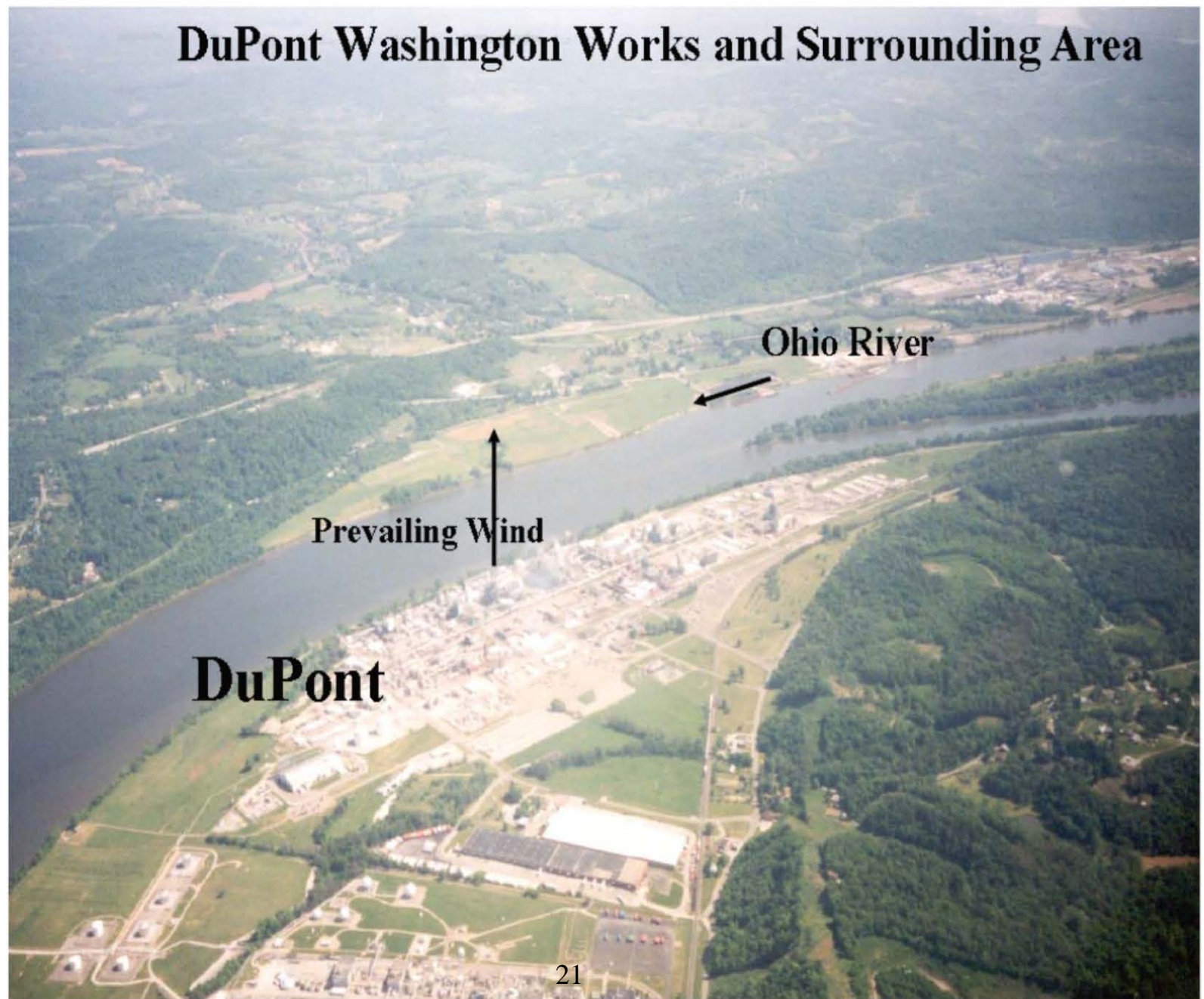
Dupont (WV plant) released PFOA from the late 1950s with a peak in the 1990s

Air emissions from plant deposited locally and entered groundwater; plant discharged into the Ohio River & entered groundwater





# DuPont Washington Works and Surrounding Area





# C8 Study

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- Probable link to PFOA and:
- Kidney Cancer
- Testicular Cancer
- Thyroid Disease
- Ulcerative Colitis
- High Cholesterol
- Pregnancy-induced Hypertension
- C8 Science Panel Probable Link Evaluation
- Reproductive/developmental studies show critical effects in animals

# **APFO – as reported by NHDES**

- Ammonium Perfluorooctanoate (APFO)  
cas # 3825-26-1
- APFO converts to PFOA after application
- Used in NH at fiberglass coater
- Atmospheric Deposition caused 30-40 square miles of groundwater/drinking water contamination (>\$ 30 million)
- Three significant water supply sources in NH contaminated
- PFOA released >550F
- <https://www4des.state.nh.us/nh-pfas-investigation/>





# MI Textile Coater

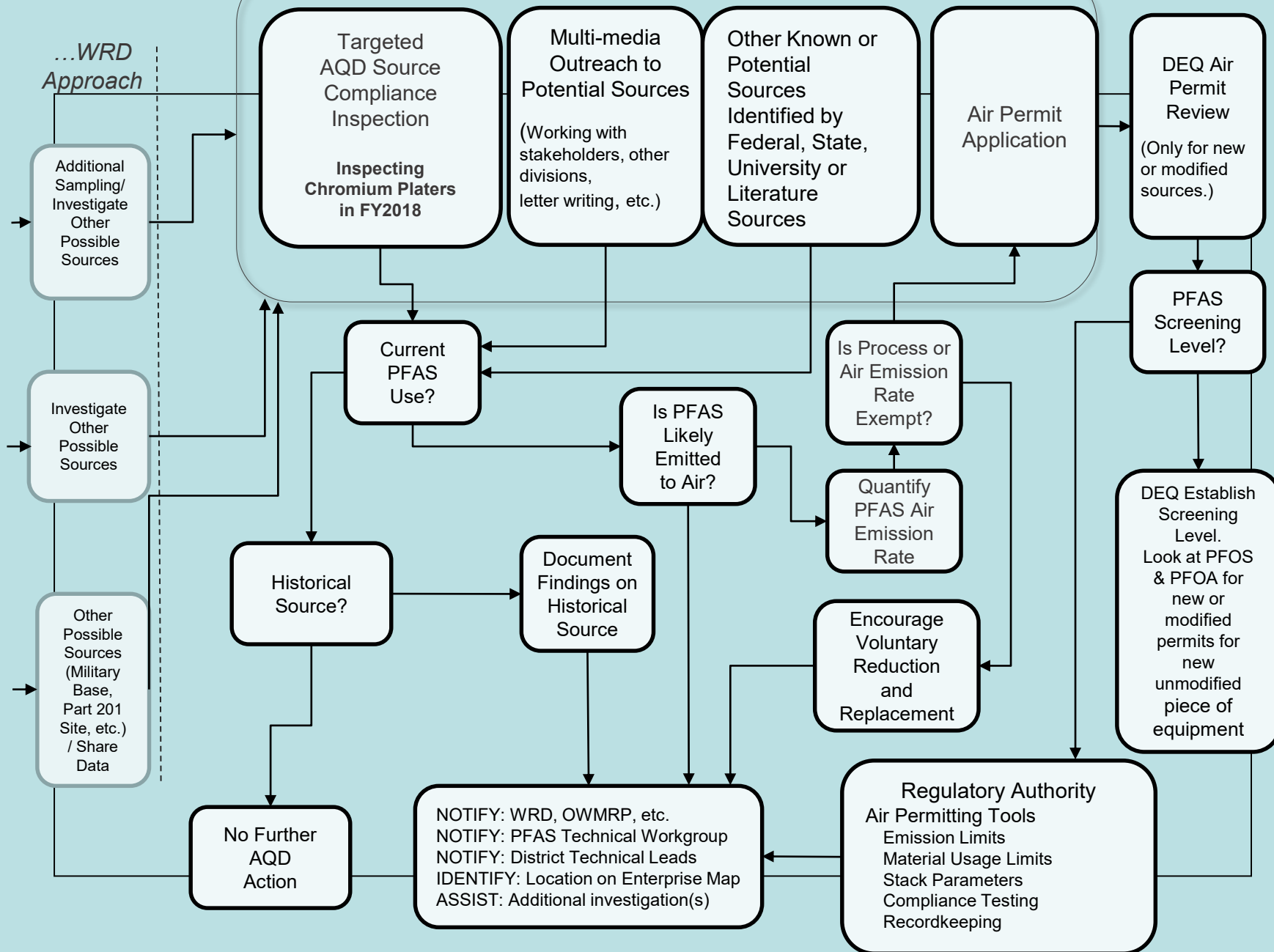
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- Fabric coater (previously scotchgard)  
FC-247 (Rescinded 1992 ITSL because of poor data)
- Batched rolls of fabrics coated & heated to 220F and 370F
- Using a new product called “Alta” – CBI  
(Confidential Business Information)
- Found exempt per Rule 290
- Wastewater < 25 ng/L PFAS



**DRAFT**

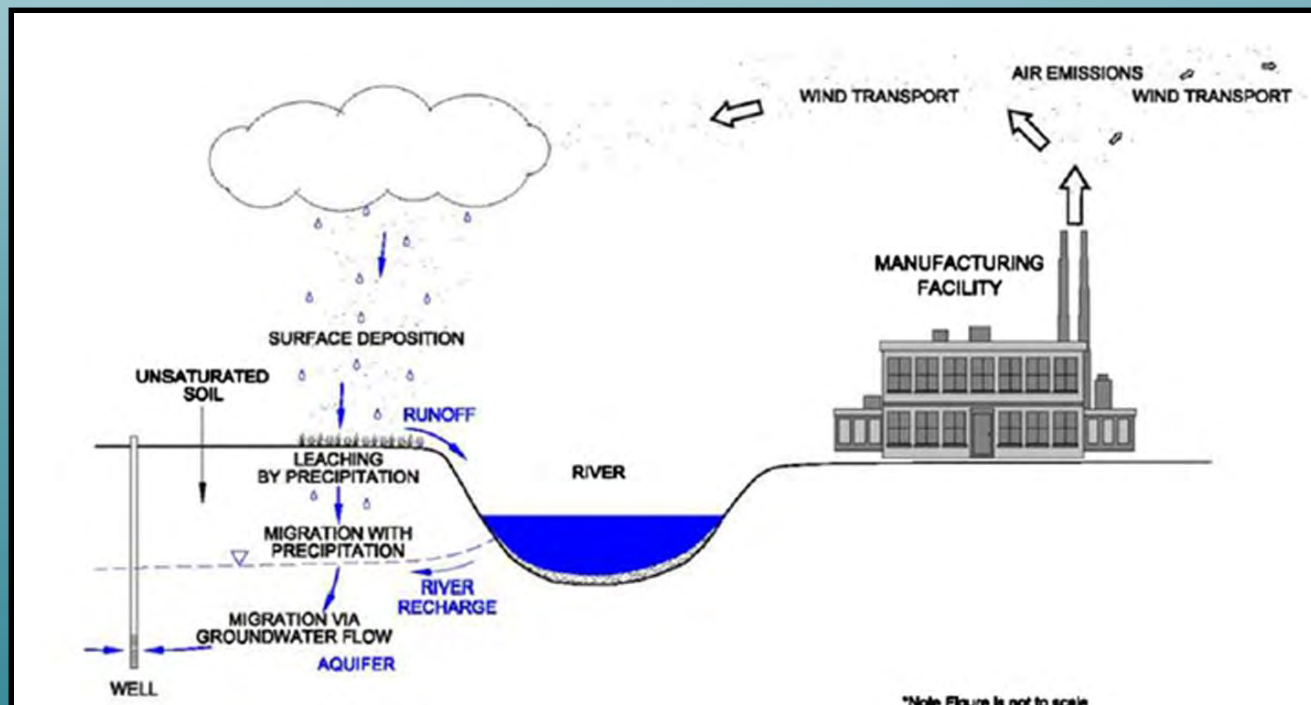
## Potential Source Identification





# ITSL for PFOS & PFOA

- ITSL for PFOS and PFOA (additive)  
 $0.07 \mu\text{g}/\text{m}^3$  – 24 hour averaging time developed
- Next? APFO

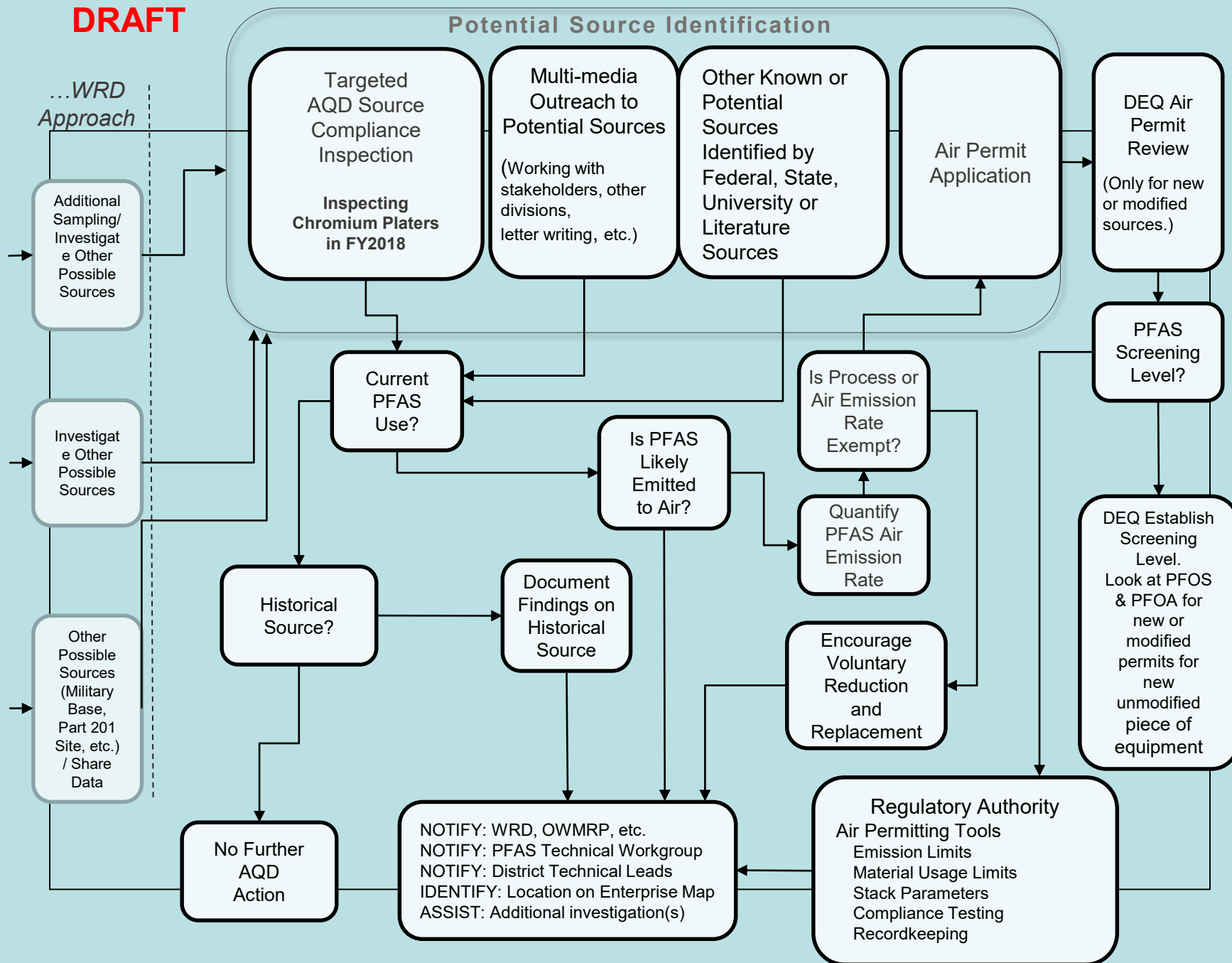


# DEMI Coating Manufacturer

- Coatings: Polyolefin = fluoropolymer resin = PTFE = Teflon  
CAS # 9002-84-0
- Determined exempt per Rule 226(a)
- If heated (>350C/>662F) then decomposition products are produced which can be highly toxic & carcinogen



**DRAFT**





# Chrome Platers

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- **40 CFR 63 Subpart N - National Emission Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks**
- **63.342(c)(2)(viii)** After September 21, 2015, the owner or operator of an affected enclosed hard chromium electroplating tank shall not add PFOS-based fume suppressants to any affected enclosed hard chromium electroplating tank.



# Chrome Platers

We Expect:

Hard Chrome Plating

Hard Chrome Plating – PFAS additions in electroplating tank

Hard Chrome Plating - PFAS are used in these tanks even if Air Pollution Control Devices are in place. PFAS used for worker protection regardless of control strategy for Subpart N

Hard Chrome Plating – more loss of PFAS to precipitates, including to tank liners and APC devices/ventilation







# Chrome Platers

We expect:

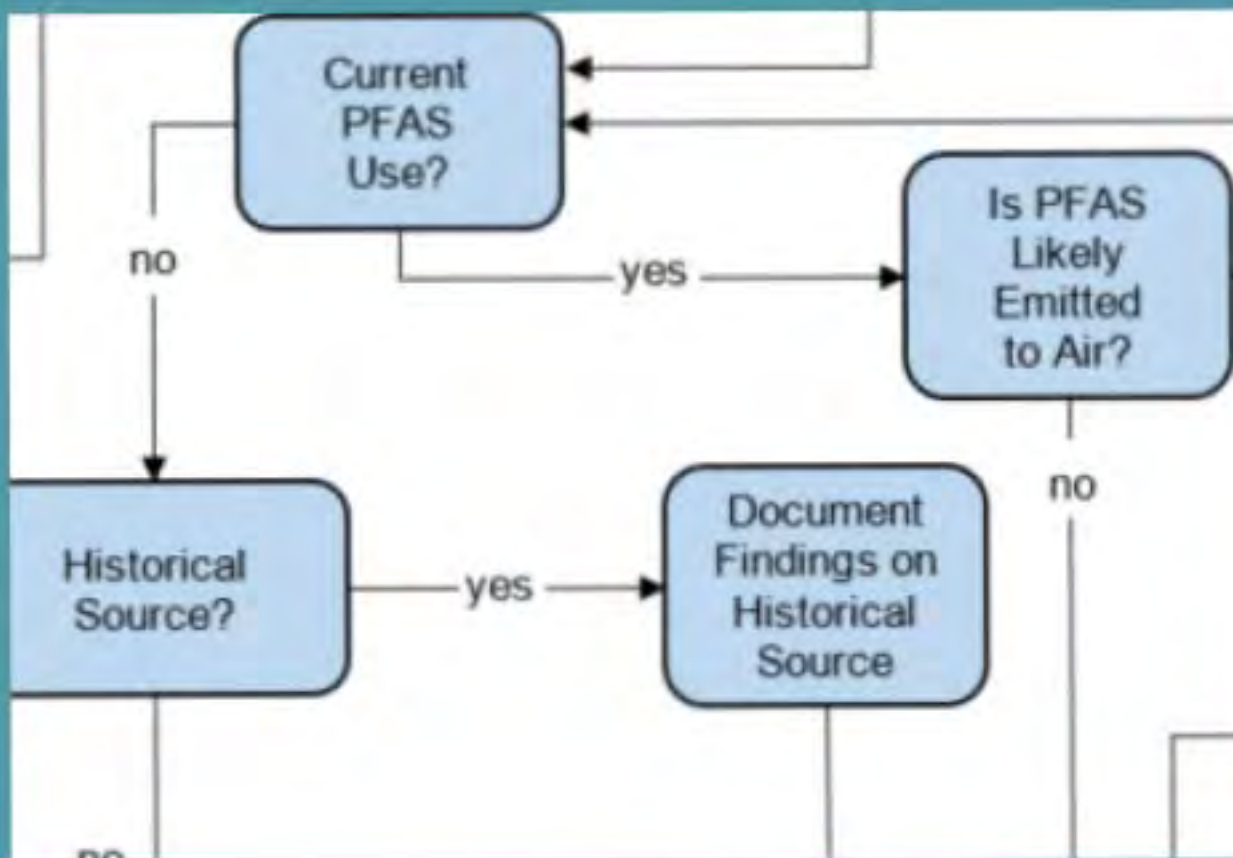
Decorative Chrome Plating



Dec Chrome Plating - PFAS additions in electroplating tank

Dec Chrome (Plastic) Plating – PFAS additions in etch tank, too

Dec Chrome Plating – more “drag out” of PFAS to downstream tanks

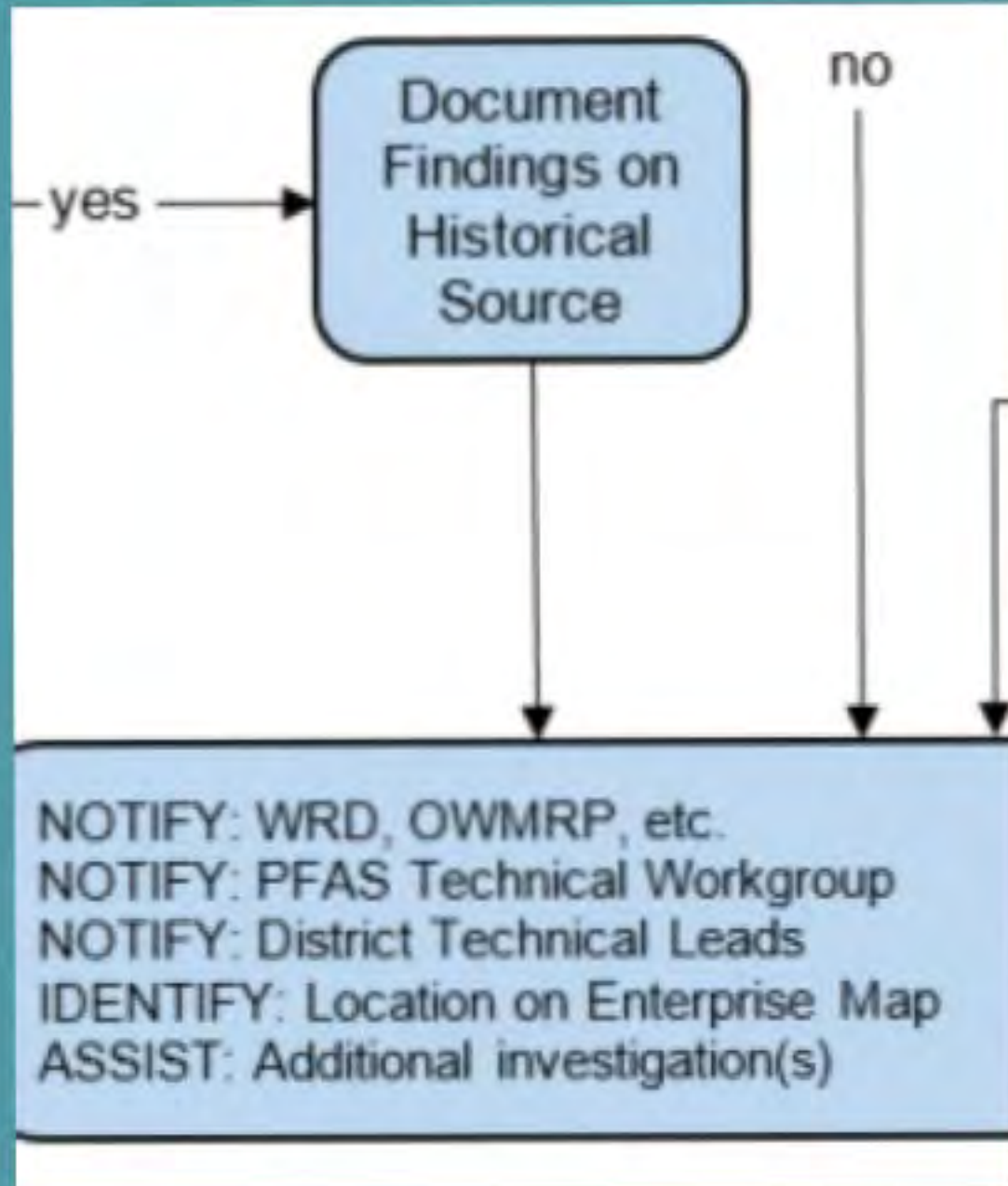






# Snow sample results

Date	Snow PFOS (ng/L)	Stormwater PFOS (ng/L)
February 2010	28,200,000	154,000
March 2010	8,900,000	730,000





# Cr Plating Inspections

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Findings from chrome plating inspections will be documented including the following:

- PFAS never used at site of potential concern (chrome plater, etc.);
- PFAS used historically, but discontinued use; or
- PFAS still in use at site;

As well as pertinent, additional details collected through the use of AQD forms





# AAC Assistance

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- Has your company ever had manufacturing processes associated with Teflon? including:
- Coating of fabrics, wire or other substrates
- PFAS use with elevated temperatures
- Utilization of fume suppressants or
- Raw materials that use: APFO, PFOA, PFOS, etc.



# **Questions/Comments Discussion**

